

DATE <u>4 February 1965</u>		TMC SPECIFICATION NO. <u>S-906</u>	0
SHEET <u>1</u> OF <u>13</u>			
RE COMPILED	<u>LEE</u> CHECKED	TITLE:	
APPROVED <u>Rac</u>		Typed by mtp	

TEST PROCEDURE  
for  
DDRR-5B RECEIVING SET, RADIO

DATE <u>4 February 1965</u>		<b>TMC SPECIFICATION NO. S- 906</b>	0
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INTRODUCTION

The DDRR-5B is the TECHNIMATICtuned receiving system that can be tuned from any remote point, via a radio circuit or land line to any of its operating frequencies and operating modes automatically by means of pre-cut tape, manual selection, or by punched card.

The RAK-102 consists of the following units: (2 per system)

RTTD-1 (decoder)	RTMU-1
HFRR-2	HFAR-1
HFSR-1	HSS-3
HFIR-1	HAF-1
AFC-3	HFP-1
HNF-1	RAK-102

The COPA-2 consists of the following units:

Two RTIA-1	One RTPA-1
One RTRS-1	
One RTKY-1	

All the above modular units are enclosed in a standard 19" rack mounted configuration.

This specification covers the operational check of the overall system. A separate specification covers the testing of individual units that comprise the system.

NOTE: Before testing these units for remote controlled functions, it is most important that the following be accomplished:

- a. The RAK-102's have been tested as a radio receiver, and that each has complied with all specifications contained within S-736 (DDR-5B Test Procedure).
- b. All of the Ledex controlled and servo controlled units have been previously aligned with their appropriate test jigs.

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I. EQUIPMENT REQUIRED

1. Punched tape puller and manual bit selection test jig.
2. Test cable as provided on the above test jig.
3. Pre-punched tape program to be used on the above.
4. VOM - Simpson #260 or equivalent.
5. COPA-2

II. PRELIMINARY CHECK-OUT

1. Mechanical Check
  - a. Defective panels, proper action of slides, etc.
2. Interconnecting Cable Check
  - a. Proper hook-up of cables as outlined cable diagram CK-789.
  - b. Proper routing, freedom from snags.

III. PRELIMINARY OPERATIONS

1. Set controls on RAK-102 as follow:

NOTE: Only that below Ledex and Servo controlled modular units need be positioned.

MODULAR UNIT	SWITCH OR CONTROL	POSITION
HFRR-1	Band Switch	Band #1
	Tune Capacitor	2.8 MC
HFSR-1	MC Switch	2 MC
	100 KC Switch	"0"
	10 KC Switch	"0"
	1 KC Switch	"0"
HFIR-1	.1 KC Switch	"0"
	Channel A Bandwidth	"1"
	Channel B Bandwidth	"1"
	RF Gain	Knob at "6 o'clock" pos.
	AFC ON-OFF	OFF

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<u>MODULAR UNIT</u>	<u>SWITCH OR CONTROL</u>	<u>POSITION</u>
HFAR-1	Channel A - DET	AM
	Channel B - DET	AM
	STANDBY/OPERATE	OPERATE
RTTD-1	AC Power ON/OFF	OFF
RTMU-1	AC Power ON/OFF	OFF

NOTE: The AN/FRR-72 consists, in addition to other equipment, two RAK-102's containing automatically controlled functions. These two RAK-102's will be tested first, starting with Receiver #1, following Para. IV, Steps 1 through 31; thence, to Receiver #2, testing in like manner.

IV. SYSTEM TEST PROCEDURE

1. Remove P-4004 from RTTD-1 and replace with cable leading from Bit Selection test jig.
2. On Bit Selection test jig, press button on right hand side. Power will then be applied to the RTTD-1. The red "TUNE" and amber "DECODER READY" lamps will light. Also, multi-vibrator relays K-4008 and K-4016 will operate.
3. Observe on the manual Bit Selector that there are seven (7) buttons. The first five are numbered consecutively, and represent bits 1 through 5 of the binary code used to control the system. The sixth button is GREEN and, when pressed, allows simultaneous transmission of the selected bits to the RTTD-1. The last button is RED and is a RESET button.
4. On the manual Bit Selector, press buttons 1, 2 and 5. This will position the master Ledex in the RTTD-1 to the MC deck, frequencies 2 through 16. Once this is accomplished, the slave Ledex, which is attached, and driving the MC shaft, may be activated. Using the code below, and observing the nixie lights on the HFSR-1 for change, step the slave Ledex from positions 2 through 16.

<u>POSITION</u>	<u>SLAVE CODE</u>
16	4
15	5
14	3 5
13	4 5
12	2 4 5
11	3 4 5
10	3 4
9	2 3 4 5
8	2 3 5
7	2 3 4
6	2 4
5	2 3
4	3
3	2
2	2 5

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5. After the 16 MC position is reached, it will be necessary to re-position the master Ledex in the RTTD-1 in order to step through positions 17 to 31 MC. The code for this group is Bits 1 and 5. Using the below code, position the slave Ledex in each of its 17 to 31 MC steps.

<u>POSITION</u>	<u>SLAVE CODE</u>
31	4
30	5
29	3 5
28	4 5
27	2 4 5
26	3 4 5
25	3 4
24	2 3 4 5
23	2 3 5
22	2 3 4
21	2 4
20	2 3
19	3
18	2
17	2 5

6. To test the 100 KC DECK slave Ledex, position master Ledex in RTTD-1 by inserting code bits 1, 4 and 5. Using the code below, step the 100 KC slave Ledex from the 0 through 9 positions.

<u>POSITION</u>	<u>SLAVE CODE</u>
9	3 4 5
8	2 3 4
7	2 3 5
6	2 4 5
5	3 4
4	2 3
3	2 5
2	4
1	3
0	2

7. To test the 10 KC DECK, position master Ledex with code 1 and 4. Then step slave Ledex for 0 through 9 positions using the same slave code as used for the 100 KC DECK.

8. To test the 1 KC DECK, position master Ledex with code 1, 2, 3 and 5. Then step slave Ledex from 0 through 9 using the same slave code as used on the 100 KC DECK.

9. To test the .1 KC DECK, position master Ledex with code 1, 3 and 5. Then step slave Ledex from 0 through 9 using the same slave code as used on the 100 KC DECK.

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10. The successful completion of Steps #4 through #9 will conclude the testing of the frequency selection deck of the HFSR-1.

11. To test the CHANNEL A IF BANDWIDTH selector, insert code 1, 2, 3, 4 and 5 to position the master Ledex. Then using the below listed slave code, step the slave Ledex from 1 KC DSB through 7.5 KC L.

12. When the master Ledex positions to the CHANNEL A IF BANDWIDTH position, it will automatically activate the servo motor in the HFRR-2 causing it to search the dial seeking a signal from the HFSR-1. When it is found, the servo motor will stop, slowly reverse, and lock on this signal. The band and frequency this servo motor selects should correspond to that which is being read on the nixie lights of the HFSR-1. When in the SYNC position, the operate lamp of the HFR-2 will light.

<u>POSITION</u>	<u>SLAVE CODE</u>
7.5 L	2 4 5
7.5 U	3 4
3.5 L	2 3
3.5 U	2 5
15	4
6	3
1	2

13. To test the CHANNEL B IF BANDWIDTH selector insert code 1, 3 and 4. Then, using the same slave code as CHANNEL A BANDWIDTH, step the slave Ledex from the 1 KC DSB through 7.5 KC L.

14. To test the CHANNEL A DETECTION, position the master Ledex with code 1, 2, 4 and 5, and using the code below, step the slave Ledex from the AM position through the SSB position.

<u>POSITION</u>	<u>SLAVE CODE</u>
SSB	4
CW	3
AM	2

15. To test CHANNEL B DETECTION, position the master Ledex with codes 1, 2, 3 and 4. Using the same slave code as CHANNEL A DETECTION, step the slave Ledex from the AM position through to SSB.

16. The RF GAIN control may be tested by inserting codes 1, 2, 3 and 5. Using the below-listed slave code, step the RF GAIN slave Ledex from the 0 through AGC position.

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<u>POSITION</u>	<u>SLAVE CODE</u>
9	3 4 5
8	2 3 4
7	2 3 5
6	2 4 5
5	3 4
4	2 3
3	2 5
2	4
1	3
0	2

17. The AFC ON/OFF switch is tested by positioning the master Ledex with codes 1, 2 and 3. Then, to activate the solenoids which drive the switch, use code 2 for OFF position and 4 for ON position.

18. To test the bandswitching and servo positioning functions of the HFRR-2, place pre-programmed punched tape marked Test Tape "A" in tape puller/reader unit of test jig. Depress BLACK button on left hand side of TAPE READER. WHITE LAMP adjacent to button will ignite. Further, the WHITE LAMP on the RTTD-1 marked "DECODER READY" will also ignite. Then, depress RED button on TAPE PULLER. Notice that the RED lamp next to this button will ignite; in addition, the RED TUNE lamp on the RTTD-1 will light. This will also activate the tape-pulling mechanism in the test unit which will advance the test tape. The tape will continue to step, causing the MC, 100 KC, 10 KC, 1 KC and .1 KC to rotate in sequence, and the band switch to align itself to the proper band as indicated by the MC nixie light.

19. When the .1 KC switch has functioned and come to rest, the TUNE capacitor motor in HFRR-2 will start searching the band seeking a signal from the HFSR-1. When this signal is located, the TUNE capacitor motor will stop and lock on this signal which should correspond frequency-wise on the HFRR-2 dial to that which is being read out on the HFSR-1 nixie lamps.

20. After the above functions have been completed, the RTTD-1 will de-energize itself automatically, causing the RED DECODER READY lamp to extinguish; also, the RED lamp on the RED lamp on the TAPE PULLER to extinguish. As a result of this tune cycle, the following should be observed on the nixie readout lamps on the HFSR-1:

<u>MC</u>	<u>100 KC</u>	<u>10 KC</u>	<u>1 KC</u>	<u>.1 KC</u>
2	2	2	2	2

The TUNE capacitor in the HFRR-2 should be resting at this frequency as indicated on its dial drum.

a. After the aforementioned has been completed, repeat operation to advance test tape to its next tune cycle. continue this cycling procedure until entire tape has been fed through the tape puller. The results indicated below

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should be observed.

<u>TEST CYCLE</u>	<u>MC</u>	<u>100 KC</u>	<u>10 KC</u>	<u>1 KC</u>	<u>.1 KC</u>
2	3	3	3	3	3
3	4	4	4	4	4
4	5	5	5	5	5
5	6	6	6	6	6
6	7	7	7	7	7
7	8	8	8	8	8
8	9	9	9	9	9
9	10	10	0	0	0
10	11	11	1	1	1
11	12	12	2	2	2
12	13	13	3	3	3
13	14	14	4	4	4
14	15	15	5	5	5
15	16	16	6	6	6
16	17	17	7	7	7
17	18	18	8	8	8
18	19	19	9	9	9
19	20	20	0	0	0
20	21	21	1	1	1
21	22	22	2	2	2
22	23	23	3	3	3
23	24	24	4	4	4
24	25	25	5	5	5
25	26	26	6	6	6
26	27	27	7	7	7
27	28	28	8	8	8
28	29	29	9	9	9
29	30	30	0	0	0
30	31	31	1	1	1

NOTE: It should be observed that the servo motor governing the TUNE capacitor in HFRR-2 should search and approach the desired frequency on the slide rule dial in the most direct way. Using the mid-point of any of the eight band positions as a guide, observe that if the frequency desired is to the right or left of this mid-point, the servo will approach the frequency from its previous position either right or left via the shortest route.

21. This concludes the preliminary testing of RAK-102. Assuming Steps #4 through #20 have been successfully completed, remove power from RTTD-1 by pressing RED button on the test jig. All the lamps on the RTTD-1 will extinguish. Remove test jig cable from J-4004 on the RTTD-1, and replace with P-4004 on CA-923.



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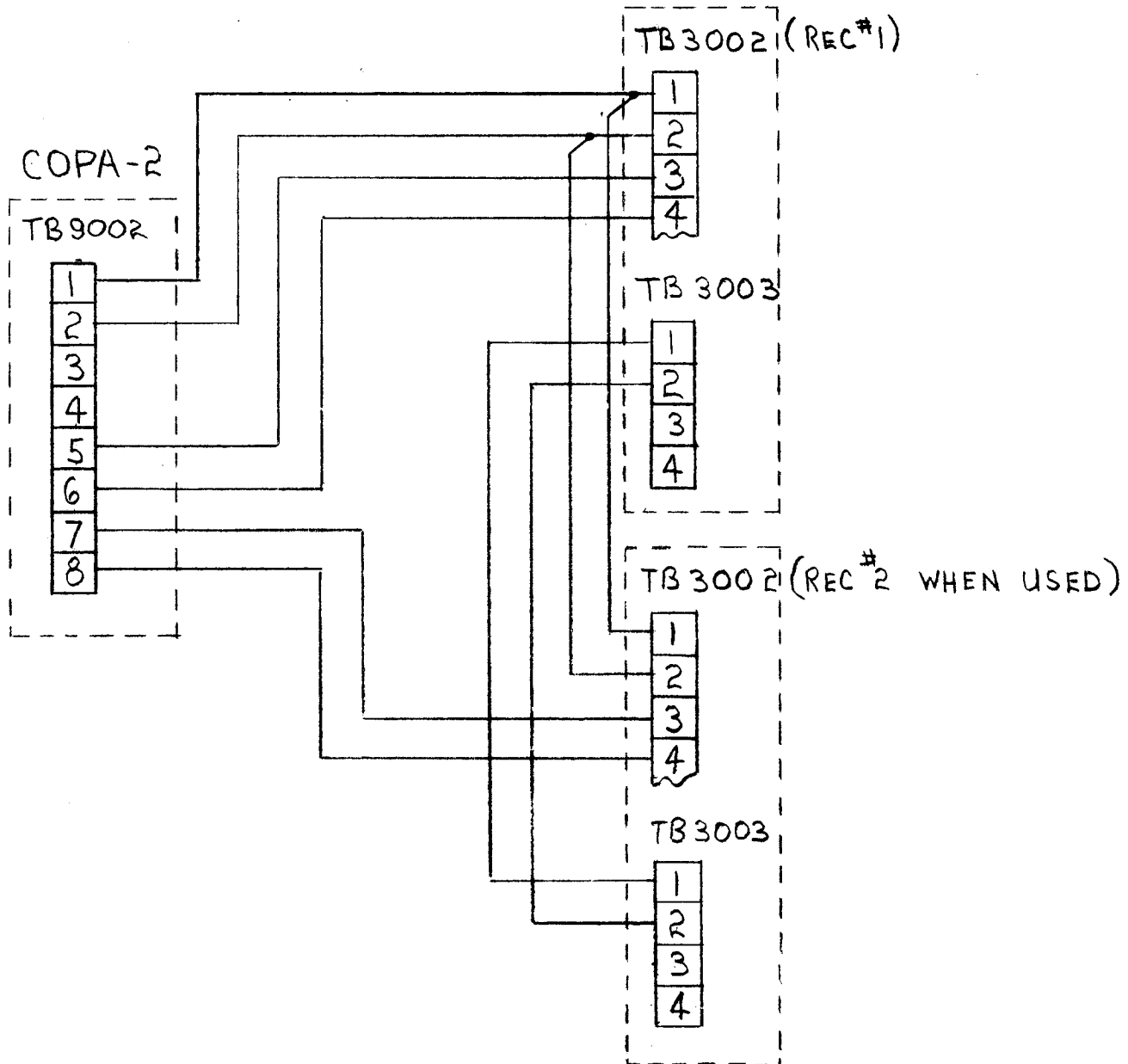
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22. When the RAK-102 comprises one, two or more such units of a system, each additional RAK-102 should be tested by repeating steps 1 through 20, as heretofore outlined in this specification.

23. When the proper cable has been restored, place the RTTD-1 DECODER READY toggle switch to the ON position. The white lamp directly above it will light.

24. On the RTMU-1, turn the AC POWER switch to the ON position. The white lamp above it will light.

25. Affix a test cable between RAK-102 and a COPA-2 as indicated below.



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26. On COPA-2, place Receiver #1 RTIA ON/OFF POWER switch to ON. Turn Receiver #2 RTIA to OFF. Indicator lamps in all windows of Receiver #1 unit should light. In addition, the FAULT lamp will ignite.

27. On RAK-102, place the MC switch to the 2 MC position. The indicator lamp in the upper left hand corner of the RTIA-1 frequency readout should read 2.

28. The MC switch on the HFSR-1 should be ~~repeated~~ manually to each of its 31 positions while observing that the RTIA-1MC readout will reflect the changes.

29. The above procedure should be prepared for the 100 KC DECK switch, stepping the switch from 0 through 9 positions, and observing the change in the corresponding readout lamp.

30. Step #29 should be duplicated for the remainder of the decks in the HFSR-1, ensuring that readout lamps in the RTIA-1 follow the correct sequence and in order.

31. The CHANNEL A and CHANNEL B IF BANDWIDTH, and DETECTION along with the RF GAIN and AFC indicators should also be stepped through their individual positions. Noting the change in the respective readout lamps located in the lower half of the RTIA-1.

32. This completes the testing of the readback system of the RAK-102 with the exception of the IN TUNE PROCESS and READY lamps.

33. On COPA-2, place Receiver #2 RTIA ON/OFF POWER switch to ON. Repeat steps 26 through 31 as outlined in this specification.

34. On the RTPA, place PROGRAMMER POWER ON/OFF toggle switch to ON. Place PUNCH-READER POWER to ON position. Rotate rotary switch in upper right hand corner to the TAPE READER position.

35. Insert pre-programmed punched tape marked "Test Tape 'B'" into the tape reader portion of the RTKY-1. into this unit.

36. As the tape is being fed through the RTKY, it should be noted that the IN TUNE PROCESS lamp on the RTIA, Receiver #1, is lit, and the FAULT lamp is extinguished.

37. The first information from the test tape will be for the positioning of the MC DECK on the HFSR-1. After positioning the master Ledex in the RTTD-1, the slave Ledex will respond to the 17-31 MC information, but will step in reverse order, starting with 31, 30, 29 etc., until 17 mc is reached when it will stop. (NOTE: When the Ledex steps in reverse order, it will do so by making a 360° rotation.) During this sequence, the TUNE lamp on the RTTD-1 will light. By pressing the TAPE READ button on the RTPA-1 again, bit information to position the master Ledex to the 2-16 position will be fed by the tape. The MC slave Ledex will now step (reverse order) starting with 16 MC thru to 2 MC, and stop.

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38. The test tape is pre-programmed to actuate the following other functions sequentially: CHANNEL A IF BANDWIDTH, CHANNEL A DET, CHANNEL B IF BANDWIDTH, CHANNEL B DET, AFC ON/OFF, and finally the RF GAIN control. It will be necessary to press the TAPE READ button on the RTPA-1 after each function has cycled.

39. After completing the above test for Receiver #1, repeat steps 33 through 38 for Receiver #2.

40. In order to insure manual (push button) operation mode of the RTPA-1, the random selection of several frequency and mode positions should be programmed in. This may be accomplished by rotating the rotary selector switch of the RTPA-1 to MANUAL OPERATION. The PUNCH-READER power switch may be turned to OFF at this time.

41. On the RTRS-1, depress the appropriate EQUIPMENT SELECTOR switch. Then select several frequency and mode positions, and observe that the RAK-102 selected modular units respond correctly. To test the servo mechanism in the HFRR-2, it is necessary to program a position on CHANNEL A IF BANDWIDTH. This will automatically actuate the servo motor in the HFRR-2, causing it to search the dial and to lock in on a signal from the HFSR-1. When it locks in to this signal the OPERATE lamp will ignite on the HFRR-2. Also, the green READY lamp on the RTIA will light, and extinguish the IN TUNE PROCESS lamp.

42. When the DDRR-5B is used in conjunction with an MSG(C) system, refer to TMC Specification S-918 for further testing procedure.

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THE TECHNICAL MATERIEL CORP.  
MAMARONECK, N.Y.

## TEST DATA SHEET FOR EACH RAK-102

SERIAL NO.: \_\_\_\_\_

MFG. NO.: \_\_\_\_\_

### II. PRELIMINARY

1A	Mechanical	_____	OK
2	Blower Operation	_____	_____

### IV. PROCEDURE

- |     |  |       |    |
|-----|--|-------|----|
| 4.  | MC DECK responds to each 2 thru 16 code.   | _____ | OK |
| 5.  | " " " " " 17 thru 31 code.   | _____ | OK |
| 6.  | 100 KC DECK responds to each 0 thru 9 code.  | _____ | OK |
| 7.  | 10 KC DECK " " " " " " " " .   | _____ | OK |
| 8.  | 1 KC DECK " " " " " " " " .  | _____ | OK |
| 9.  | .1 KC DECK " " " " " " " " .   | _____ | OK |
| 11. | CHAN. A IF BANDWIDTH responds to each position 1 KC thru 7.5 KC L.   | _____ | OK |
| 14. | CHAN. A DETECTION responds to each AM thru SSB position  | _____ | OK |
| 16. | RF GAIN control responds to each position AGC thru 1.  | _____ | OK |
| 17. | AFC ON/OFF switch responds to ON and OFF code.   | _____ | OK |
| 13. | CHAN. B IF BDWTH responds to ea. position 1KC thru 7.5KC L.  | _____ | OK |
| 14. | CHAN. B DETECTION responds to each AM thru SSB position  | _____ | OK |
| 18. | Nixie lights in HFSR-1 respond as outlined in Para. 20   | _____ | OK |
| 18A | Band switch aligns itself in proper band within range of frequency readout of HFSR.  | _____ | OK |
| 19. | Tune capacitor of HFRR-2 searches and locks onto frequency corresponding to that being read out by nixie lights of HFSR-1. | _____ | OK |
| 20. | HFRR-2 and HFRR-1 correspond to test tape "A", test cycles 2 thru 30.  | _____ | OK |
| 20A | Tune capacitor starts search in most direct route.   | _____ | OK |
| 26. | RTIA-1 MC readout reflects changes of MC DECK of HFSR-1 and reads correct frequency.                                       | _____ | OK |
| 29. | RTIA 100 KC readout correctly indicating.  | _____ | OK |
|     | " 10 KC " " "  | _____ | OK |
|     | " 1 KC " " "   | _____ | OK |
|     | " .1 KC " " "  | _____ | OK |

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TEST DATA SHEET NO. 2  
FOR  
EACH RAK-102

IV. PROCEDURE - Cont'd

- |     |   |       |    |
|-----|---|-------|----|
| 31. | RTIA-1 CHAN A BDWTH correctly indicating.   | _____ | OK |
|     | " " " DET " "   | _____ | OK |
|     | " " B BDWTH " "   | _____ | OK |
|     | " " " DET " "   | _____ | OK |
|     | " RF GAIN Control " "   | _____ | OK |
|     | " AFC ON/OFF " "  | _____ | OK |
| 36. | IN TUNE PROCESS lamp lit.   | _____ | OK |
|     | FAULT lamp extinguished.  | _____ | OK |
| 37. | TEST TAPE "B" responds RAK-102 to all its positions sequentially as outlined in Para. 38.   | _____ | OK |
| 40. | RAK-102 responds to random programming of RTPA-1 by manual selection.   | _____ | OK |
| 41. | When more than 1 receiver is used, RTRS-1 equipment selector panel, selects correct receiver as outlined in Para. 41 of Test Specification. | _____ | OK |
|     | 41(a) GREEN lamp on RTIA-1 lights.  | _____ | OK |
|     | 41(b) AMBER lamp on RTIA-1 extinguishes.  | _____ | OK |
|     | 41(c) WHITE lamp on HFRR-2 lights.  | _____ | OK |

TESTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

